EPA ENVIRONMENTAL EDUCATION

BUILD YOUR OWN AQUIFER

BACKGROUND:

Many communities obtain their drinking water from underground sources called **aquifers**. Water suppliers or utility officials drill wells through soil and rock into aquifers to supply the public with drinking water. Homeowners who cannot obtain drinking water from a public water supply have private wells that tap the groundwater supply. Unfortunately, groundwater can become contaminated by improper use or disposal of harmful chemicals such as lawn care products and household cleaners. These chemicals can percolate down through the soil and rock into an aquifer—and eventually into the wells. Such contamination can pose a significant threat to human health. The measures that must be taken by well owners and operators to either protect or clean up contaminated aquifers are quite costly.

NOTE: This demonstration should follow a class discussion on potential sources of pollution to drinking water supplies.

OBJECTIVE: To illustrate how water is stored in an aquifer, how groundwater can become contaminated, and how this contamination ends up in the drinking water well. Ultimately, students should get a clear understanding that what happens above the ground can potentially end up in the drinking water supply below the ground.

MATERIALS NEEDED:

1 6” x 8” clear plastic container that is at least 6-8” deep (shoebox or small aquarium)
1 lb. of modeling clay or floral clay
2 lbs. of white play sand
2 lbs. of aquarium gravel (natural color if possible) or small pebbles
(Hint: As many small rocks may have a powdery residue on them, you may wish to rinse and dry them on a clean towel prior to use. It is best if they do not make the water cloudy.)

1 drinking water straw
1 plastic spray bottle (be sure the stem that extends into the bottle is clear)
1 small piece (3” x 5”) of green felt
1/4 cup of powdered cocoa
Red food coloring
1 bucket of clean water and a small cup to dip water from bucket
Scotch tape

PROCEDURE:

1. To one side of the container, place the drinking water straw, allowing approximately 1/8” clearance with the bottom of the container. Fasten the straw directly against the long side of the container with a piece of tape. Explain to the class that this will represent two separate well functions later in the presentation (if not placed at this time, sand will clog the opening).

2. Pour a layer of white sand completely covering the bottom of the clear plastic container, making it approximately 1½" deep. Pour water into the sand, wetting it completely, but there should be no standing water on top of the sand. Let students see how the water is absorbed in the sand, but remains around the sand particles as it is stored in the ground and ultimately in the aquifer.

3. Flatten the modeling clay (like a pancake) and cover half of the sand with the clay (try to press the clay into the three sides of the container in the area covered). The clay represents a **"confining layer"** that keeps water from passing through it. Pour a small amount of water onto the clay. Let the students see how the water remains on top of the clay, only flowing into the sand below in areas that the clay does not cover.

4. Use the aquarium rocks to form the next layer of earth. Place the rocks over the sand and clay, covering the entire container. To one side of the container, slope the rocks, forming a high hill and valley (see illustration below). Now pour water into your aquifer until the water in the valley is even with your hill. Let students see the water around the rocks that is stored in the aquifer. They will also notice a **"surface"** supply of water (a small lake) has formed. This will give students a view of the ground and surface water supplies, both of which can be used for drinking water purposes.

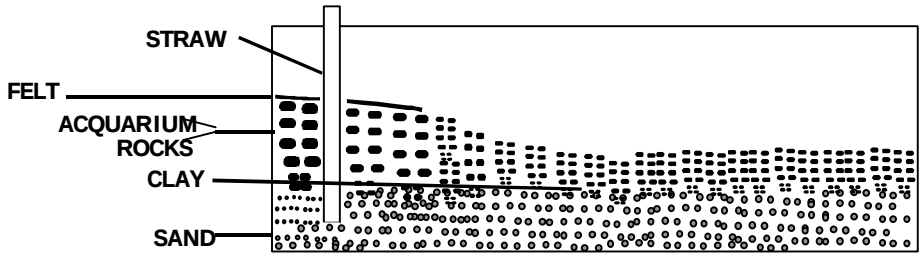
5. Next, place the small piece of green felt on top of the hill. If possible, use a little clay to securely fasten it to the sides of the container it reaches.

6. Sprinkle some of the cocoa on top of the hill, explaining to students that the cocoa represents improper use of things like lawn chemicals or fertilizers.

7. Put a few drops of the food coloring into the straw, explaining to students that people often use old wells to dispose of farm chemicals, trash, and used motor oils. Students will see that it colors the sand in the bottom of the container. This is one way that pollution can spread through the aquifer over time.

8. Fill the spray bottle with water. Make it rain on top of the hill and over the aquifer. Quickly students will see the cocoa (pesticide/fertilizer) seep down through the felt and also wash into the surface water supply.

9. Take another look at the well you contaminated. The pollution has probably spread farther. Remove the top of the spray bottle and insert the stem into the straw. Depress the trigger to pull up the water from the well. (Water will be colored and "polluted.") Explain that this is the same water that a drinking water well would draw for them to drink.



SIDE VIEW OF CONTAINDER